

COCHLEAR IMPLANTS, SPEECH PERCEPTION, AND COGNITIVE LOAD

Cochlear implants (CI) allow for understanding spoken language in people with severe hearing loss. However, the limited signal transmission causes problems in acoustically difficult situations, such as several people talking simultaneously. These so-called "cocktail-party" situations are important for participation but pose high demands on auditory processing. Moreover, good cognitive processing abilities are of importance, since they may counteract the perceptual demands in acoustically difficult situations that may lead to excessive use of cognitive resources – referred to as high levels of listening effort.

The success of cochlear implantation is typically determined by speech audiometric tests. However, for various reasons, they only partially mirror speech perception in everyday life. One important reason is that everyday communication typically takes place under a certain cognitive load, particularly involving attention and memory capacity: In a cocktail-party situation it is often not clear who speaks next. Thus, several potential sources of information have to be monitored in order to extract the information of interest. Furthermore, in order to follow a conversation, being able to remember who has previously made a specific utterance is of vital importance.

Impact of such a cognitive load on CI users during speech perception in acoustically difficult situations has never been investigated systematically before. Hence, an important understanding for the estimation of communication abilities with CIs in conditions relevant to everyday life is missing. The proposed project aims at closing this serious gap by investigating speech perception under varying cognitive load and describing the underlying mechanisms. In particular, individual cognitive abilities of CI users are considered, which may play an important role in speech understanding, but have received limited attention so far. In addition, different methods are used to determine the listening effort associated with speech understanding in cocktail-party situations and the ability to differentiate competing speakers is described by gaze fixations. The core hypothesis of this project is that the combination of perceptual demands and cognitive load has a significant negative impact on speech understanding and may result in high levels of listening effort, but that individual cognitive performance can serve as a mediator.

By taking speech recognition, listening effort, and cognition into account the project is expected to open new horizons in terms of a more holistic view of CI users' speech perception mechanisms in communication situations relevant to everyday life, consequently promoting future developments in ecologically valid diagnosis and rehabilitation with cochlear implants.

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